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Case report

Complex electrophysiology intervention in a patient with an inferior vena cava filter

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ABSTRACT

Catheter ablation is currently a routine clinical method for the treatment of heart rhythm disorders. The presence of a filter in the lumen of the inferior vena cava represents a mechanical obstruction that may complicate or contraindicate the procedure. Still, there is not enough information available on this topic and there is no research data on the catheter ablation of complex left atrial arrhythmias with a transseptal puncture in the presence of an inferior vena cava filter. Our case report represents a successful complex electrophysiology intervention in both the left and right atria with femoral venous access in a patient with an inferior vena cava filter.

Introduction

Radiofrequency catheter ablation has become a routine clinical method in recent years and in many cases it is also the most effective treatment of arrhythmias. In less complex heart rhythm disorders it can be performed through the jugular or subclavian vein. However, the transfemoral approach is preferred; it provides a minor risk of complications, more flexibility and reduced radiation exposure for physicians. It is also crucial for treating complex arrhythmias. Any abnormalities in the anatomy or barriers in the patency of veins can complicate or obviate the procedure.

An IVC filter placement is a substitute method used in the prevention of pulmonary embolism. In our background, the device is used in only a small number of patients and its efficacy and safety is still a matter of debate [1,2]. Concerning electrophysiology intervention with the transfemoral approach, only electrophysiology studies and catheter ablation in the right atrium were performed in these patients [3–6]. Access through an IVC filter carries a high risk of complications, such as the dislodgment of the filter or the entrapment of guide wires [7–12]. Catheter ablation of complex arrhythmia

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involving a transseptal puncture and intervention in several heart chambers in a patient with an IVC filter is not routinely performed, which makes this procedure attractive. Such a demanding procedure requires the use of more guide wires, increases the risk of filter displacement or damage and also makes the time frame of the intervention longer, thus resulting in a greater risk of a thromboembolic complication or bleeding.

Case report

A 70-year-old man with a history of thromboembolic disease treated by anticoagulant therapy had an IVC filter (Vena Tech™ LP Cava Filter, B. Braun Interventional Systems Inc.) placement performed in 2000. After an electrophysiology study at our department in April 2011 (using a jugular and subclavian vein approach), focal atrial tachycardia was diagnosed and the appropriate medication therapy was recommended. In March 2012, the patient underwent bioprosthetic aortic valve replacement and double aortocoronary bypass surgery and suffered from post-operative atrial fibrillation which was resolved by the administration of amiodarone. Following the planned lower extremity vascular surgery, a supraventricular tachycardia with a 2:1 block and ventricular frequency around 130/min appeared and was diagnosed as atypical atrial flutter in June 2012. Electrical cardioversion restored the sinus rhythm and the medication was altered. In September 2012, the patient's condition worsened, the recurrence of atypical atrial flutter was reported and a complex electrophysiology procedure was strongly recommended.

Methods

After the patient's preparation the procedure was initiated by a right subclavian vein cannulation and a decapolar catheter (*Inquiry, St. Jude Medical, Inc.*) was inserted into the coronary sinus using a 7 Fr sheath. The femoral vein was punctured and two transseptal sheaths (*Swartz™ FasthCath SL1, St. Jude Medical, Inc. (8F) and Agilis™, St. Jude Medical, Inc. (8.5F)*) were placed into the inferior vena cava (IVC) right below the IVC filter. Angiography confirmed the patency of the filter and proved the absence of thrombus. Two straight guide wires were used for the IVC filter crossing due to the potential problematic nature of J-tip guide wires [9–11]. The filter was passed without any complications by the over wire method in the anteroposterior projection under continuous fluoroscopic guidance (Fig. 1). Sheaths were placed just below the right atrium. All major manipulation during the procedure was monitored by fluoroscopy. Atrial flutter of an average frequency of 250/min with the earliest activation at the interatrial septum (IAS) was recorded by passing a duodecapolar diagnostic catheter (*Hallo™ XP, Biosense Webster, Inc.*) and an ablation catheter (*Celsius ThermoCool F Type, Biosense Webster, Inc.*) into the right atrium through transseptal sheaths. Entrainment mapping detected a concealed entrainment with a short post-pacing interval (PPI) in the upper region of the IAS; the remainder of the right atrium did not contribute

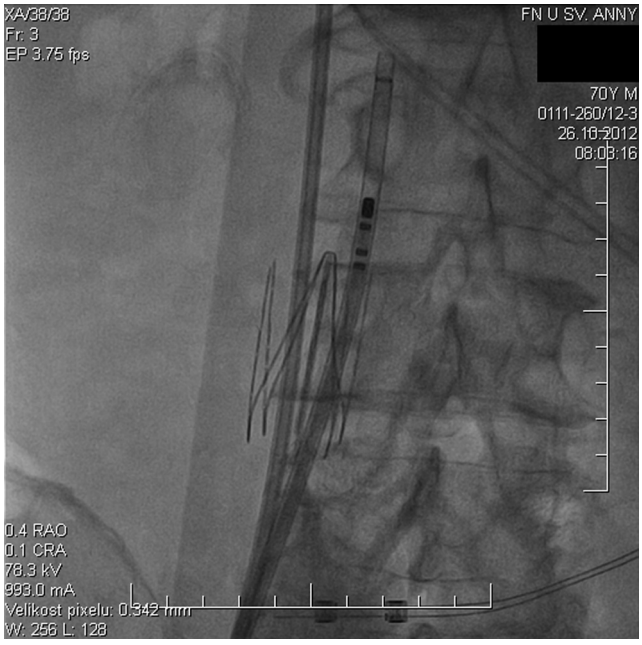

Fig. 1 – X-ray image showing transseptal sheaths passing through an IVC filter (Vena Tech™ LP Cava Filter).

to the arrhythmia pathogenesis demonstrated by manifest entrainment with a long PPI. Regarding the history of cardiac surgery in the region adjacent to the left atrium and the mechanism of the arrhythmia, non-isthmus-dependent atrial flutter originating presumably in the left atrium was declared (Fig. 2).

Therefore a double transseptal puncture was performed with continuous heparinization. Through a SL1 sheath a duodecapolar diagnostic catheter (*Reflexion Spiral™, St. Jude Medical, Inc.*) was introduced and an Agilis sheath was used to pass an ablation catheter (*Celsius ThermoCool F Type, Biosense Webster, Inc.*); both catheters were introduced to the left atrium (Fig. 3). A 3D electroanatomic map of this chamber was then acquired supported by 3D rotational angiography. Entrainment and activation mapping registered the earliest activation in the right pulmonary veins region with intermittent concealed entrainment with a short PPI. Mapping also demonstrated extensive areas of fibrosis in the anterior wall with minimal or undetectable local potentials. Because of the difficulty of the evaluation of the activation in this region the right pulmonary veins were isolated, but no effect from this procedure was observed.

Due to the futility of further mapping in this region, an electroanatomic map of the adjacent structure of the right atrium was created. Ongoing mapping revealed a small area in the lower posterior part of the IAS with fractionated potentials, concealed entrainment and an optimal PPI. The subsequent delivery of RF ablation as far as the IVC caused a change in the morphology of atrial flutter and deceleration to a frequency of 200/min. A typical atrial flutter was then documented converting to sinus rhythm after an attempt at entrainment on the CTI. Another RF lesion completed a bidirectional block of the CTI.